

Value investing in the Finnish stock market

Information Systems Science

Master's thesis

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2011

VALUE INVESTING IN THE FINNISH STOCK MARKET

OBJECTIVES OF THE STUDY

The purpose of the thesis is to study a value investing method (i.e. Magic Formula) in the Finnish market. The aim is to find out, if the stocks that are ranked and chosen by this method actually have higher returns in the future than stocks on average. The main objective is to compare the returns of the value portfolios to benchmark index and to see if it can be outperformed. There are five other objectives that will be studied. First, is there a difference between the returns of top ranked stocks and the bottom ranked stocks. Second, what is the optimal holding period for the portfolio, and third, how many stocks should be chosen to maximize the returns. Fourth objective is to compare the volatility and the returns of the portfolios to market portfolio. Last objective is to study whether something is gained if one more factor is added to portfolio ranking.

DATA

The data for this study consists of 50 to 124 companies, depending on the quarter, listed in Helsinki Stock Exchange between 2000 and 2009. Quarterly report and market data of 40 periods have been used to form two key ratios that are the basis for the stock ranking. All the other sectors except banking are included into the study, and companies are limited so that the minimum market capitalization is ten million. Also the companies that have delisted during the time period or have listed in the middle of the period are included.

FINDINGS

The findings of this research prove that value premium does exist and the benchmark index can be outperformed. This confirms the results of previous literature. Unlike some other studies suggested, larger portfolios did not necessarily provide higher or more constant returns. In this study, the small portfolios that were based on Magic Formula performed better in shorter holding periods but as composite measure of Magic Formula and Price-to-Book was used, larger portfolios were better. The higher returns of value portfolios are often validated with increased risk. Based on this research the volatility was lower among value portfolios than it was for the index.

KEY WORDS

Value investing, efficient market hypothesis, behavioral finance, magic formula

ARVOSIJOITTAMINEN SUOMESSA

TUTKIMUKSEN TAVOITTEET

Tämän tutkielman tavoitteena on tutkia arvosijoittamista Helsingin pörssissä. Tarkoituksena on selvittää, voiko tutkittavan metodin avulla valittujen osakkeiden tuotto olla keskimääräistä parempi pitkällä aikavälillä. Pää tavoitteena on verrata arvosakkeista muodostetun salkun tuottoa vertailuindeksiin. Lisäksi tutkimus pyrkii vastaamaan viiteen muuhun tutkimusongelmaan, joista ensimmäisessä selvitetään onko menetelmän avulla järjestettyjen osakkeiden tuotoissa eroja, kun verrataan parhaita ja huonoimpia. Onko löydettävissä optimaalinen pitoaika salkulle, ja kuinka monta osaketta täytyisi valita parhaan tuoton saavuttamiseksi. Miten riski ja tuotto reagoivat salkun koostumuksen ja pitoajan muutoksiin, sekä vaikuttaako kolmannen tekijän lisääminen menetelmään millään tavalla.

LÄHDEAINEISTO

Lähdeaineistona on käytetty Helsingin pörssissä vuosina 2000-2009 listattuna olleiden yritysten osavuositarkastuksia sekä markkinainformaatiota. Kaksi tunnuslukua, joihin arvosijoitusmenetelmä pohjautuu, on muodostettu aiemmin mainitun datan pohjalta ja osakkeet laitettu paremmuusjärjestykseen tunnuslukujen perusteella. Mukana on kaikki sektorit pankkeja lukuunottamatta, koska niiden tilinpäätösdata ei ole täysin vertailukelpoista muiden alojen kanssa, niitä ei näin ollen voitu sisällyttää tutkimukseen. Myös yritykset jotka ovat poistuneet pörssistä tai listautuneet tutkimusjakson aikana, sisällytetään aineistoon jotta tutkimuksen tulokset olisivat tämän osalta luotettavampia.

TUTKIMUKSEN TULOKSET

Tämän tutkimuksen tulokset vahvistavat sen, että salkku, joka on muodostettu arvosijoitusmenetelmällä, tuottaa paremmin pitkällä aikavälillä kuin vertailuindeksi. Joidenkin aikaisempien tutkimusten mukaan salkuissa, joissa on useampia eri osakkeita, tuotot ovat vakaampia ja korkeampia. Tutkimus Suomen markkinoilta kuitenkin osoittaa, että lyhyellä pitoajalla pieni salkku tuottaa paremmin ja volatiliteetti on matalampi kuin suurilla salkuilla. Kun tutkittavaan arvosijoitusmenetelmään lisättiin kolmas tekijä, keskimääräinen tuotto parani entisestään.

AVAINSANAT

Arvosijoittaminen, tehokkaiden markkinoiden hypoteesi, tekninen analyysi

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1. INTRODUCTION

A lot of evidence exists to support a belief that portfolios composed of value stocks could be earning higher returns than a stock market index. Many books and academic papers have been written about this topic, for example *The Little Book that Beats the Market* by Joel Greenblatt. With the help of his simple formula to pick the right stocks and hold for a one-year period, a portfolio's average return has exceeded 30% annually, compared with S&P500's annual 12% between 1988 and 2004. Choosing the right stocks is a first step, but other factors might even improve the returns as Rousseau and van Rensburg (2003) are stating in their study; also the length of the holding period of a portfolio matter and not just the selection of stocks.

By this date most of the books and publications regarding value investing methods concern foreign stock markets but there is some evidence from Finland as well. Finland was included in a research by Bird and Casavecchia (2007) as they were comparing the returns of value and growth stocks in 15 European countries, finding a clear evidence of value premium. Pätäri and Leivo (2009) studied different valuing methods exclusively on the Finnish stock market between 1993 and 2008 and found some proof for these assumptions.

However, previous studies on the Finnish market do not take into account the different holding periods for the stocks and whether it matters how often you change the positions in a portfolio in order to maximize the gains. This seems to be a rather important factor since proof has been found elsewhere (Lakonishok et al. (1994), Bird and Whitaker (2003), Rousseau and van Rensburg (2003) and Bird and Casavecchia (2007)) that it makes a difference.

The aim of this thesis is to examine the returns of various portfolios in Helsinki Stock Exchange between 2000 and 2009, formed by using the Magic Formula method by Joel Greenblatt. Different holding periods and portfolio sizes are compared to observe how these factors affect the risk and return of the portfolio. The main question is whether it is possible to beat the market in the long run. Second and third questions try to find answers for the optimal holding period and the size of the portfolio. Fourth subject of

the study will be the volatility of a portfolio and how this is affected by the different sets of combinations of size and holding period. Last objective is to examine if an additional value measure, Price-to-Book, improves the performance of Magic Formula portfolio.

One of the most well known investors using value investing is Warren Buffet who states that the idea is to find an outstanding company at a sensible price. Benjamin Graham is said to be one of the inventors of this idea and Joel Greenblatt's Magic Formula is derived from the original formula and suited to better use financial data available nowadays. The idea of the Magic Formula is that it uses just two financial measures to rank the stocks and then the best of those are selected for each period. Return on tangible capital measures how efficient the company is and the second ratio, earnings yield, measures how cheap the stock of the company is. Although simple and self evident, the formula uses market input, which is the stock price, as well as data from balance sheet and income statement. Stocks that rank on top on Greenblatt's Magic Formula will be chosen and then the process is repeated yearly. It seems that this one-year period has been chosen originally because of the certain tax procedures in US. In this study simulation of different holding periods are conducted to determine if that has any relevance. To keep processes somewhat straightforward, taxes are ignored in this research.

In addition to the benchmark index, the Magic Formula will also be compared to one more simple value ratio that is Price-to-Book (P/B). This ratio describes how expensive the company is in comparison to its book value and according to previous studies, it is considered as one of the basic ratios to rank stocks to value and growth categories. Some assets, such as intellectual property are not included in book value, which may cause some companies to look more expensive even though they have hidden value.

Data for the research has been gathered from the Thomson Reuters' extensive database and calculations and simulations are done with Microsoft Excel. The data period for this research is from March 2000 to December 2009. Since there have been both upturns and downturns on the market during ten-year period, results should be more versatile. There are 40 three-month holding periods that are studied, and between 50 and 124 companies suitable for the research, have been listed on the OMX Helsinki Exchange during that time.

1.1. Research objectives

The main research question is whether it is possible to beat the Finnish stock market index in the long run by picking up a certain portfolio with specified value investing method?

Additional research questions are:

- Do top ranked portfolios have higher returns than bottom ranked portfolios?
- What would be the ideal time period for holding each portfolio to maximize gains?
- How many stocks should be chosen?
- How the number of stocks and the holding period affect the volatility of a portfolio?
- How does it affect if Price-to-Book value is added as a third factor to Magic Formula?

1.2. Scope of the study

The scope of this study is limited to companies that are listed on OMX Helsinki Stock Exchange. To minimize the possibility of the so called bid ask bounce¹, only companies larger than 10 million in market capitalization will be included. This might not completely remove the problem as there could be large, less liquid companies, but to be able to include enough companies for the sample, 10 million is set as a limit. There are 149 different companies listed during the ten-year time period while one portfolio consists of 5-15 different stocks at the time so it should give rather good results if this method picks up relatively better stocks from the range.

Research includes also the companies that delisted during the sample period or listed somewhere in the middle to get more realistic results of the market. The number of

¹ Bid ask bounce means that buying and selling prices are very far from each other, which would cause large movement in the stock price when the transaction is fulfilled.

companies ranges from 50 in the first period to the maximum of 124 companies along the time frame. Data includes all the sectors from OMX Helsinki except banks and insurance companies since they have a little bit different way of forming financial statements and therefore would not be comparable to the ratios used in this research.

As there are different series of stocks within the companies, only the common stock will be used for the ranking and if there are two or more series of these common stocks the most liquid one is chosen. If for some reason price or other relevant data is missing, this ratio is left blank for that company and it is not included in ranking at that period.

1.3. Definitions

In this part, all the key terms used in this research are defined. The list can be found in Appendix 2 as well.

- Earnings Yield = $EBIT / \text{Enterprise value}$
- EBIT = Earnings before interest and taxes
- EBITDA = Earnings Before Interest, Taxes, Depreciation and Amortization
- Enterprise value = Market capitalization + Net debt
- Net Fixed Assets = Total Assets - Total Current Assets - Goodwill Net
- Net Working Capital = Total Current Assets - (Total Current Liabilities - Short Term Interest Bearing Debt)
- Return on Capital = $EBIT / (\text{Net Working Capital} + \text{Net Fixed Assets})$
- Stock price = the close price of the day used. In case it happens to be weekend or the market is otherwise closed, the previous price will be chosen.
- Value Stock = There is no precise definition of value stock. Stock that is undervalued and has good expectations of value appreciation is considered as value stock. There are various valuation methods; high dividend yield, low P/E or low P/B could indicate that the stock is believed to be a value stock.

Here are some common ratios to group stocks to value or growth (glamour) portfolios. If ratios are reported this way, value stocks are on top and growth stocks at the bottom, but opposite ratios can also be used and then the rankings are vice versa.

- B/P = Book to price
- CF/P = Cash flow to price
- D/P = Dividend to price
- E/P = Earnings to price
- $EBIT(DA)/EV$ = $EBIT(DA)/$ Enterprise value
- S/P = Sales to price

Most of the ratios may also be reported on company scale, such as Market-to-Book, which means that the whole market value of the company is divided by the book value of the company. The ratio is still the same, as when dividing the stock price by the book value of one stock.

When portfolios are formed stocks will be held for a certain time in each simulation before they are sold and another set is bought. This period is referred to holding period and the period may vary from three to eighteen months. If for example at the beginning of the simulation it is decided to have seven stocks for three periods, it means that seven stocks are bought and held for 9 months, after which they are sold. This process is then repeated as long as the ten-year time frame has been reached. The last holding period in the simulation may be shorter than the one set in the beginning if the total time period of ten years is reached before.

1.4. Structure of the thesis

This thesis is divided into five chapters. This introductory Chapter 1 has described the research objectives and the structure of the thesis. Chapter 2 presents previous studies of the subject and introduces the opposing opinions of value investing, behavioral finance and efficient market hypothesis. After reviewing the previous literature, the third chapter introduces the methods used and how the data is gathered. Fourth chapter

analyses the findings and compares those with previous literature. It is divided into four sections; first subchapter introduces the performance of value portfolios and comparison to market averages, second covers different holding periods and number of the stocks chosen. Third subchapter analyses risk and return based on the volatility of various Magic Formula portfolios and last subchapter presents findings of different comparisons between the Magic Formula, Price-to-Book value and combinations of these two factors. Finally, the fifth chapter concludes the thesis by discussing practical implications, the limitations of the study and provides suggestions for further research.

2. REVIEW OF PREVIOUS LITERATURE

Chapter two introduces previous literature and findings of investing in general, the views of behavioral finance as well as value investing. This chapter has been divided into three subchapters. Some basic finance assumptions like efficient market hypothesis (EMH) and random walk theory are first introduced in subchapter 2.1 to get some general knowledge about the beliefs in finance and the opposing view to value investing.

Following subchapter 2.2 discusses research about behavioral finance and why people tend to act like they do on the stock market. Topic also covers some of the issues why they make certain decisions that might be in contradiction to finance laws. Behavioral finance might explain some of the reasons why stocks are not always priced correctly by the market and this could give an opportunity to later benefit from the corrections in prices.

Last subchapter 2.3 presents previous findings and discussions about value investing as a method. Lots of different approaches have been taken in order to find a way to get larger returns than some indexes. There are several key ratios that are researched as well as holding periods for portfolios and what could be the ideal number of stocks in a portfolio. These are also the main questions this paper will try to answer, while only the Finnish stock market is covered.

2.1. General finance assumptions regarding investing

The following quotes describe the beliefs of those that do not believe in value investing or other methods explaining abnormal returns in the stock market.

“Efficient market hypothesis is an investment theory that states it is impossible to "beat the market" because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information. According to the EMH, stocks always trade at their fair value on stock exchanges, making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices. As such, it should

be impossible to outperform the overall market through expert stock selection or market timing, and that the only way an investor can possibly obtain higher return is by purchasing riskier investments.” – Investopedia

“With "random walk" price movements in securities are unpredictable. Because of this random walk, investors cannot consistently outperform the market as a whole. Applying fundamental analysis or technical analysis to time the market is a waste of time that will simply lead to underperformance. Investors would be better off buying and holding an index fund.” – Malkiel, Burton (Leading proponent of efficient market hypothesis)

“Second theme of the book is the risk-reward trade-off. This too is no-free-lunch notion, holding that in competitive stock markets, higher expected returns come only at a price: the need to bear greater investment risk.” – Bodie, Z., Kane, A. & Marcus, A.J. “Investments”, McGraw-Hill International Edition

In one of the early studies Sharpe (1964) points out the basic assumption existing in financial markets, as he introduced capital market line where the risk and the rate of return are on the axes. Sharpe’s model represents capital markets for rational investors and it is believed an investor is able to choose which ever point from the line, but if more return is expected of the portfolio, it automatically means more risk as well. The same conclusion can be drawn from efficient market hypothesis, where prices fully reflect all the available information. Because of this no one can really outperform the market without choosing to tolerate more risk. Various studies have been made on this topic including the groundbreaking research by Fama (1970) concluding that “the evidence in support of the efficient markets model is extensive and (somewhat uniquely in economics) contradictory evidence is sparse.”

Efficient market hypothesis can be divided into three different categories based on the type of information subset of interest (Fama 1970). “Strong-form tests are concerned with whether individual investors or groups have monopolistic access to any information relevant to price information. One would not expect such an extreme model to be an exact description of the world, and it is probably best viewed as a benchmark against which the importance of deviations from market efficiency can be judged. In the

less restrictive semi-strong-form test the information subset of interest includes all obviously publicly available information, while in the weak form tests the information subset is just historical price or return sequences” Fama (1970). As it explores the historical data, weak-form is obviously most easily tested and large volumes can be included in tests, results from weak form testing support the theory strongly.

Weak-form market efficiency has been recently studied by Borges (2010) on a paper concentrating on six European stock markets between January 1993 and December 2003. This study gives some interesting results as the data used is quite recent and the statistical methods applied are not used in most of the older studies. The data period has been tested as a whole, but it has also been divided into smaller periods, to see if there are differences between them. Results from the study provide rather mixed evidences of EMH as Greece and Portugal show signs of becoming more efficient in recent years which would be expected as they are moving from being emerging markets to developed markets. On the other hand results from France and UK are quite the opposite as mean reversion has been increasing.

Several research papers like Borges (2010) have been written, since Sharpe and Fama, from different perspectives of EMH. Yet, nearly 40 years later after reviewing different theoretical and empirical evidence Lo (2007) concludes there is still no consensus among economists, even though statistical analysis has improved and more advanced theoretical models have been built. Lo (2007) mentions that one of the reasons is that EMH is not well-defined. More detailed specifications have to be made regarding the information structure and investor’s preferences in order to get most out of the hypothesis. Borges (2010) suggests that different results from the same data might be due to the more advanced techniques developed recently.

One common explanation also mentioned on Lo’s (2007) paper for markets to deviate from EMH is that people are not reacting as they should for the new information. They might underreact or overreact for some reason and it would cause prices to move more than expected. The market would soon get back to its right place as rational investors act accordingly. This has generated an investment strategy called contrarian investing, where people are trying to benefit from such mispricing and always act unlike conventional investors, “losers are purchased and winners are sold” (Lo, 2007).

Contrarian investing is related to value investing as they are also looking for investments undervalued by the market.

2.2. Behavioral finance

Behavioral finance tries to explain stock market anomalies that are in contradiction to efficient market hypothesis and why investors are not acting as they should regarding the perfect investor rationality. It is believed that the characteristics of individual investors, as well as the information structure, will affect the investment decisions and this way the market as a whole. This could generate possibilities to market anomalies and excessive profit making.

According to Subrahmanyam (2007) until recently the field of finance and the theories were mostly based on investor rationality. It did not try to understand why people trade in the first place or how they form portfolios. More recently there have been studies such as Barberis et al. (1998), Daniel et al. (1998) and Hang and Stein (1999) suggesting explanations for the behavior of investors and how some might take advantage of the mispricing of stocks. Barberis et al. (1998) have found evidence that there are both under- and overreaction on the market depending on the time horizon examined. In the short term, which is between one and twelve months, prices seem to underreact to news which means that the returns in the future are higher. This alone is quite an opposite view to efficient market hypothesis. In the longer run between three to five years series of positive news will push the prices higher all the time resulting overpricing which will lead lower returns in the future. They separate the type of news to those with low strength and high weight such as corporate announcements and to those that are opposite, for example good earnings announcements. Latter type of information will lead to overreaction whereas the corporate announcements will have a negative impact as prices underreact.

In contrast to the findings of Barberis et al (1998) where investors overreact to private information and underreact to public information, Daniel et al. (1998) found that continuing overreaction may cause returns to positively autocorrelate in the short run

but in the longer-run again correlate negatively as the information becomes less important, when the time goes by. Hong and Stein (1999) found the similar evidences of short term positive and long term negative autocorrelation but they also researched what kind of stocks are mostly affected and hereby comprehend more opportunities for better than average returns. In Hong and Stein's (1999) model reason for short-term return continuation is "a consequence of the gradual diffusion of private information, combined with the failure of news-watchers to extract this information from prices". There are two things considered to explain the rate of information diffusion, firm size and stock's residual analyst coverage. If the smallest companies are left outside being less liquid for trading, evidence suggests that profitability declines sharply by market capitalization. Smaller companies get less attention and the news about them gets out more slowly (Hong and Stein, 1999) and they seem to include larger value premium (Dhatt, et al. 1999) that could result from being followed by a smaller amount by analysts. Large glamour companies are preferred more by institutional investors (Lakonishok et al. 1994) as they are more easily justified than some smaller and less known firms.

2.3. Value investing as a method

People, who are supporters of the modern portfolio theory and efficient market hypothesis, believe that it is impossible to outsmart the market in the long run, yet there is more and more research about the value investing and how value strategies result in higher returns. Warren Buffet, probably one of the most recognized investors in the world, is an advocate for value investing and his track record is rather impressive. He is one of the disciples of Benjamin Graham who is said to be the first proponent of value investing. Graham has written several books out of which two must be mentioned, *Security Analysis* (published 1934) – said to be the bible for investors and *The Intelligent Investor* (published 1949), that is "By far the best book on investing ever written" as Warren Buffet puts it.

Since those days, a variety of academic studies have been written on value investing, as the topic seems to divide people into those who believe in and those who are believers of modern portfolio theory, where it is nearly impossible for an individual to be smarter than the market. Basu (1977), Fama and French (1992, 1996 and 1998), Lakonishok et al. (1994), Chan and Lakonishok (2004) and several others have found evidence in their studies on value premium.

In an early research by Basu (1977) companies from New York stocks exchange were studied between April 1957 and March 1971 to find out whether P/E ratio could be used on explaining the investment performance of stocks. He found that some sort of market inefficiency may have existed even when making risk adjustments to returns, as public information seems not to be instantaneously reflected on prices. Dhatt et al. (1999) did similar findings two decades later when studying small-cap stocks and the value versus growth effect in returns. In their study value stocks outperformed growth stocks whether categorization was defined by P/E, P/S or M/B. Price-to-sales seemed to be the best indicator out of these three but results were even better if all three ratios were used in selecting the portfolio.

As mentioned in previous paragraphs there have been clear evidences of value premium on the US market. Later several studies have been conducted on international markets as well. Fama and French (1998), Chan and Lakonishok (2004) and Bird and Whitaker (2003) among some others verified superior returns of value over growth stock hold around the world after researching most of the biggest markets globally.

Chan et al (1991) did a research on the Japanese market to find out these assumptions are similar, and that book-to-market ratio and cash flow yield affected mostly expected returns. They also suggested findings should be interpreted carefully since there might be another fundamental variable explaining the stock returns. As the topic of value investing has gained more attention, it has been studied recently more in European markets to see if the similar conclusion can be made. Study by Chahine (2008) confirms value premium exists around Europe. In that study asset pricing analysis is based on international CAPM and the multifactor model and findings show that the high earnings growth rate plays an important role in results between value and glamour stocks. It also rejects the efficient market hypothesis, as there seem to be signs that investors do not

react to positive changes in the expected EPS change of growth stocks but do react in regard to value stocks.

As Lakonishok et al. (1994) wrote, even though there is proof from several different studies, that returns are higher on value strategies, none of them really seem to be sure what the reason is. Fama and French (1992) explained the higher returns by efficient market hypothesis and the increased risk on those stocks with higher returns. Lakonishok et al. (1994) found that superior returns cannot be justified with risk based on standard deviation. Their research showed that standard deviations were larger on small stocks but after adjusting those with size results were nearly the same. So, by choosing large cap value stocks one can still have better returns with the same risk level. One reason that explains value premium is that market expects higher growth rates of earnings, cash flow, etc. of glamour stocks, based on their past performance. When those are not met, these stocks are not performing as well as value stocks that were underestimated. Third suggestion for value premium comes from Bird and Whitaker (2003) as they add that by simply holding many stocks that are less favored in the same portfolio, one could expect better returns.

Even though most of the studies conclude value strategy outperforms growth strategy only quite a few of them mention what the performance of single stock in the portfolio is. Rousseau and van Rensburg (2003) observed from the distributions of returns that not all the stocks perform well but actually the minority of the shares constitute the majority of value effect. This would explain that choosing a larger portfolio generates more reliable returns since the possibility of picking up a stock with huge returns would more likely to be included in the portfolio. The similar conclusion can be found on the paper written by Anderson and Brooks (2007) as they were studying optimal size for the value and glamour portfolios. They found out that smaller portfolios earned the highest returns and the volatility was much bigger, which could be the result of a few really volatile stocks making good returns; still the Sharpe ratios were not the biggest in the study.

Different ratios used for rankings

So far it can be seen that there are several different ratios used for ranking stocks to value and growth categories. Some of the different ratios used in previous studies include book-to-price (B/P) by Chan et al. (1991), Piotroski (2000) and Zhang (2005), price to earnings (P/E) by Basu (1977), Rousseau and van Rensburg (2003) and Anderson and Brooks (2007) and sales-to-price (S/P) used by Bird and Casavecchia (2007). These measures have proven to get good results around the globe with different ratios being superior in varying markets. However Dhatt et al. (1999), Dhatt et al. (2004) and Pätäri and Leivo (2009) suggest that using more than one ratio may result in even better returns. In their study Dhatt et al. (2004) documented that best results regarding both return and risk were achieved when the portfolio was formed based on P/S, M/B and P/E ratios rather than just one of these. Pätäri and Leivo (2004) found the combination of D/P and EBITDA/MV being superior regarding returns. Besides the individual and composite value measures, used to form portfolios and study superior return over markets, momentum indicators have been used (Bird and Whitaker, 2003, Bird and Casavecchia, 2007 and Chahine, 2008) to have better timing on portfolio formation. These studies have used past returns as a price momentum indicator (Bird and Whitaker, 2003 and Chahine, 2008) when choosing value or growth stocks that have had a good growth rate, which has enabled even better returns than having the basic value portfolio. However, according to Bird and Whitaker (2003) results were better for only shorter holding periods and according to Bird and Casavecchia (2007) growth portfolios were getting more benefit from the momentum than value portfolios.

2.3.1. Holding period

Multiple studies have shown the evidence of value premium but less attention has been given to different holding periods of portfolios and what kind of effect that could have on returns. Subject has been studied more recently and the findings of Lakonishok et al. (1994), Bird and Whitaker (2003), Rousseau and van Rensburg (2003) and Bird and

Casavecchia (2007) suggested that longer holding periods will increase the returns of value portfolios.

Bird and Whitaker (2003) used data from eight European countries to form portfolios based on four key ratios (book-to-market, dividend yield, earnings yield and sales-to-price) and were studying holding periods ranging from one to 48 months. Findings indicated that when stocks were sorted by the Book-to-Market ratio that was the most successful ratio separating good and bad performers, portfolios were adding value for three years. Another research confirmed this as Rousseau and van Rensburg (2003) ended up with similar results using P/E ratio for ranking stocks. They found out that returns became much higher when the period was extended to over 12 months, and the reliability of the returns increased. Another interesting notion was made as they found out that at least when ranking stocks based on P/E, the formation of a portfolio should be made based on data 12 months ago rather than the most recent data as it takes some time for stocks to have good price momentum. On the other hand price momentum has been proven to be a great help in order to get most out of value strategies also in shorter holding periods (Bird and Whitaker, 2003). Their research showed that using past 6 and 12-month returns in addition to value ratio, even better value stocks could be found for a holding period less than a year, but as time went by performance became poorer.

Extensive European study was recently made by Bird and Casavecchia (2007) where sales-to-price was chosen as a valuation method, since earlier research indicated that it as well as book-to-market ratio (Bird and Whitaker, 2003) were two of the best determinants for ranking stocks. Finland was one of the 14 countries in this research of 8000 companies. In the first phase, stocks were only ranked based on sales-to-price and divided into four equally weighted quartiles and the holding period was ranging from three to 36 months. After 12 months, the outperformance of value to growth portfolios was significant and verified the previous finding that it is hard to know when value premium takes effect and that value investor need to be patient. When momentum indicators were again added on the second step, the excess returns of value portfolios became even more evident, which once more emphasizes the timing of portfolio formation. One of the biggest implications of this study (Bird and Casavecchia, 2007) concerned market efficiency as value portfolios turned out to be less risky, data

snooping² was cancelled out being the reason and transaction costs could not explain it either when rebalancing was made only once a year.

2.3.2. Finnish Evidence of Value Investing

There is one very recent study solely from the Finnish market (Pätäri and Leivo, 2009) comparing the different value metrics and multiple combinations of those to see how returns and standard deviations change between value and glamour portfolios. The study includes data between 1993 and 2008 when 51 to 110 companies were listed in Helsinki Stock Exchange. Valuation criteria include six individual ratios (E/P, EBITDA/EV, CF/P, D/P, B/P and S/P) and eight composite value measures which are different combinations of individual ratios. In their research Dhatt et al (1999) suggested that by combining ratios, results could be even better and right stocks could be screened out more effectively. The data was divided into three portfolios based on each of these ratios. In addition to calculating only returns for the portfolios, also a few well-known risk measures were included (Sharpe ratio, Jensen alpha and 2-factor alpha) to rule out the assumption that more returns automatically means a riskier portfolio.

Results from Pätäri and Leivo's (2009) research verify that value premium exists also on the Finnish market and there are large differences between the valuation multiples in risk and returns on portfolios. The best individual ratio according to their study is dividend-to-price (D/P) which has the highest average return and lowest volatility among the 3-quantile portfolios. In total all the value portfolios outperform the market portfolio and similarly in nearly all occasions market portfolio is better than the glamour portfolio with a couple of exceptions. The highest return is achieved by a composite portfolio (D/P and EBITDA/EV) whereas the smallest risk when only a single ratio (D/P) is used. Since the size effect has been used to explain the superior returns on value portfolios, it was also studied on the Finnish market using CAPM model, to see if the argument is valid. However, no signs of a size anomaly could be found and a similar conclusion was presented by Dhatt et al. (2004). Still, the most interesting notion is

² Data snooping (Data mining) means that the best and the most suitable results are picked from the tests.

made when comparing performance on bull and bear³ markets: the value portfolios lost much less of their value on a bear market than all stocks in average (Pätäri and Leivo; 2009). On the other hand Xu and Fisher (2006) found that during the techno bubble some growth stocks were performing extremely well and value stocks suffered, yet it can be agreed market cycles definitely have an effect. There could be a solution to hedging a value portfolio during rising volatility; a long position on volatility could be used during times when the market is really nervous as we have seen lately (Qian et al. 2009).

³ Bull market means prices are rising or are expected to rise. Bear market means prices are falling and investors are highly pessimistic.

3. DATA AND METHODS

The data and methods chapter explains in detail what kind of data was used in this research as well as what have been the methods used in the study. The data chapter has been divided into two subchapters. The first describes the process of data collection and modifications that had to be made in order to better process it and to make calculations more realistic. Second subchapter explains how data periods were managed to replicate the real situation as well as possible and to avoid look-ahead bias⁴ and how calculations for portfolio values are carried through.

3.1. Data

This data section introduces resources for the data used in this study, and explains what different factors were used for building two ratios that are the key elements for this value investing method. All the data for this research is downloaded from Thomson Reuters' various databases. Most of the data is either from Thomson Knowledge database or later Thomson ONE as they combined a couple of databases during this summer. A list of all the OMX Helsinki stocks and their return indexes was downloaded from Thomson's Datastream.

The data collection itself was not too complicated as soon as the right attributes and factors were found. There were around ten different attributes that needed to be downloaded quarterly from the ten-year time period to be able to make the necessary calculations. Hence, the amount of data was substantial and not everything could be verified so the data might include some false figures but this information source is still probably the most reliable to use.

⁴ When you are using data that is not available at the portfolio formation, results will suffer from look-ahead bias. (E.g. stocks are ranked based on quarterly data at the end of March and purchase is made on a same day March 31st, in reality data is not available until May/June as it takes time for companies to publish it.)

The idea of Joel Greenblatt's magic formula is simply to find stocks that are good and cheap. Several attributes are used for creating two key ratios; return on capital, which picks the stocks that utilize their capital well and earnings yield, which chooses stocks that are relatively cheap. Figure 1 presents the calculation of Return on Capital and Figure 2 the calculation of Earnings Yield.

Figure 1: Calculation of Return on Capital

Return on Capital	
= EBIT / (Net Working Capital + Net Fixed Assets)	
Net Working Capital	Net Fixed Assets
= Total Current Assets	= Total Assets
- Total Current Liabilities	- Total Current Assets
- Short Term Interest Bearing Debt	- Goodwill Net
Net Working Capital + Net Fixed Assets	
= Total Current Assets - Total Current Liabilities + Total Debt - LT Debt	
+ Total Assets - Total Current Assets - Goodwill Net ⁵	

⁵ Goodwill is excluded from the calculation since it does not need to be renewed as capital.

Figure 2: Calculation of Earnings Yield

$$\begin{aligned} &\text{Earnings Yield} \\ &= \text{EBIT} / (\text{Market Capitalization} + \text{Net Debt}) \end{aligned}$$

3.1.1. Data gathering and modification

This section introduces how data for this research was collected and what had to be done to some key figures for more reliable results. Quarterly data from the beginning of 2000 until the end of 2009 was acquired and all the companies that were listed during that time were included except banks and insurance companies since they have a slightly different structure for their financial statements and cannot be compared due to this. The size of the company was limited so that only companies with market capitalization larger than 10 million was included since smaller companies could be less liquid and therefore bid-ask bounce could be avoided or at least minimized.

Data downloaded from Reuter's is already formatted so that it is comparable between the companies as long as one defines the same currency before importing it. As this thesis only covers Finnish companies this is not an immense issue, but still a couple of the firms might get wrong data due to this issue since they are located outside Finland. TeliaSonera, for example is from Sweden even though it is listed on OMX Helsinki as well.

Some minor modifications had to be made in order to get more accurate and reliable results from the data. Since there is EBIT divided by some factors in both key ratios used for rankings, it would have given incorrect results if for example both the numerator and the denominator were negative. Negative earnings (EBIT) is obviously not as good as positive but if you divide both with negative enterprise value the first option would get a larger ratio and such company would be ranked higher. In order to better compare companies some modifications, presented in Figure 3, had to be made to

these key ratios. There were a few options what could have been done for this issue but in this research the method was that all the figures were checked manually and if both the numerator and the denominator were negative numbers the latter was given a value of 1. This way the ratio will get a negative attribute instead of misleading positive attribute.

Figure 3: Modification of Earnings Yield in Special Circumstances

	A	B	Modified B
EBIT	100	-100	-100
EV	-20	-20	1
EBIT/EV	-5	5	-100

For better comparison between a portfolio and the index, stock price data was in a form of return index which means dividends, splits and other adjustments have already been taken into account and no manual calculations are necessary. Basically, it means money from dividends is reinvested to stocks every time and not cashed out.

3.1.2. Data periods

Within the time frame this paper examines, there have been two major upturn markets and one bigger downturn so the market conditions have changed dramatically. This could give more interesting results than a plain upturn or downturn for the whole period. Other similar studies have been using time periods ranging from ten to fifteen years most often so the ten-year time period should be quite sufficient in this study as well. Since the most interesting range for the holding period in this research is from three months to one year, there will be many different periods to analyze.

When this kind of back-testing method is used, one has to be sure data would have been available during the portfolio formation, because the data cannot be taken into account if it becomes public later. Usage of data that has not been accessible is called look-ahead bias and it usually gives better results than should be achieved.

This problem was seen and avoided by timing the purchase of portfolios two and a half months later than what was the data for ranking used. Figure 4 clarifies the idea even better. The first key figures were formed based on the quarterly report on March 31st 2000, and to be sure the data would have been accessible for everyone, ranking was calculated on June 15th 2000. The stocks that ranked the highest were also purchased on that date. The holding period may vary but the basic idea remains the same throughout the study.

Figure 4: Example of Data Periods

Periods	1	2	3	4	5	6	7	8	9
Data	31.3.2000	30.6.2000	30.9.2000	31.12.2000	31.3.2001	30.6.2001	30.9.2001	31.12.2001	31.3.2002
Prices	15.6.2000	15.9.2000	15.12.2000	15.3.2001	15.6.2001	15.9.2001	15.12.2001	15.3.2002	15.6.2002
HOLDING PERIOD 1 YEAR					HOLDING PERIOD 1 YEAR				

There is not that much value in just following how a portfolio has developed during the time period, but instead the performance should be compared with something more concrete. In this research OMX Helsinki Cap (growth) index is used for comparison. A growth index is chosen over a price index because it includes dividends, as does the portfolio in the simulation. This way performance can be compared more realistically. The OMX Helsinki Cap GI consists of all the shares traded in the OMX Helsinki and maximum weight of one share is limited to 10% of total market value of the index.

Value of the index is taken on the same day as the price of the portfolio is calculated. A quarterly value of the index is used for following how much it will gain or lose yearly

on average, during the ten-year period. Also the annualized volatility is calculated based on the average returns and compared against the portfolio.

3.2. Methods

In this section the methodology of the thesis is described in detail. The method of this study is a back-testing of financial data with stock screening and picking formula invented by Joel Greenblatt. Historical data is examined and simulated with this formula to form different kinds of portfolios to be able to decide if these would have beaten the market in the long run and how the holding period and number of stocks in a portfolio affects the results.

The idea of the Magic Formula is to look for stocks that have high return on invested capital and that also rank high when comparing the returns to enterprise value. In other words, it aims at picking stocks that are cheaper than average but at the same time utilize well the capital one has. There are several other ways to rank the stocks, for example individual ratios such as P/E, P/B or dividend yield. This paper concentrates on the Magic Formula while some comparisons to Price-to-Book value are also studied.

3.2.1. Stock ranking based on the ratios

How is the ranking then formed in practice? First, the earnings yield is calculated for all the stocks and the one receiving the highest score ranks number one, second ranks number two and so on. After this the return on capital is calculated in a similar way and again stocks receive a rank based on their ratio. Finally, these two rankings are summed up and the stock receiving the lowest total number is the best and stock that gets the highest sum is the last, the rest of the stocks go in between.

The ranking of the stocks described in the previous chapter is done for all the 40 periods that can be used in the simulation. Quarterly data is used so there might be different

stocks at the top of the rank in every three months. Figure 5 presents an example of the stocks ranking.

Figure 5: Example of Stock Ranking

RANK			Company Name	Eyield	RoC
Eyield	Roc	Total			
1	3	4	Ixonos Oyj	7,06 %	24,86 %
3	2	5	Aldata Solution Oyj	5,08 %	29,24 %
2	8	10	Wartsila Oyj Abp	5,58 %	11,18 %
13	6	19	Solteq Oyj	3,49 %	12,78 %
4	15	19	Tiimari Oyj Abp	4,76 %	8,15 %
7	13	20	Comptel Oyj	3,97 %	8,97 %
18	7	25	Kone Oyj	3,06 %	11,82 %
12	14	26	Keskisuomalainen Oyj	3,62 %	8,71 %
10	17	27	Oriola Kd Oyj	3,67 %	7,37 %

Since the period of this study is ten years and quarterly data is used there are total of 40 rankings. Some companies have existed only for a part of the time period and some have been listed the whole period but it does not change the nature of the study. Like previously mentioned, this enables more accurate results since one could not know which company will go bankrupt or face a merger at the moment of purchase.

The holding period of a portfolio means how long the specific stocks are held in a portfolio before selling them and choosing a new set. One holding period is three months as the public listed companies are obliged to release accounting information in every three months. The holding period of a portfolio remains the same throughout the simulation. If you decide to have a holding period of two quarters, it means you buy the stocks, hold them for six months, sell them off, buy a new set according to the rankings at that point and do so until the ten-year period is full.

The number of stocks is another attribute that was considered. You can choose the amount in the beginning and the same number will remain until the end. The chosen stocks will obviously differ based on the rankings they get since the highest-ranking

stocks are always chosen. It could also happen that the same stocks are sold and purchased back again if the ranking suggest that. This research does not take into account the transaction costs as in real life you would not sell and buy back the same stocks but instead you could choose a different stock to buy, keep the old one in a portfolio or make some rebalancing for that stock.

3.2.2. Purchase and selling process

After sorting and ranking stocks based on the key figures at the beginning of the first period, a specific number of different stocks will be purchased. Nowadays, the minimum lot is one stock but until fall 2006 the minimum used to be as much as 200 stocks in Finland. This new practice makes it possible to invest smaller amounts and to build a more diversified portfolio, as monetary sums can be very small. Still, the transaction costs have to be taken into account and the smaller sum one spends, the larger share will usually go into the fees. There is typically a percentage commission or fixed minimum fee involved in the transaction if the total value is below certain set limits.

Another benefit that has come out from lowering the minimum lot to one stock is that trading has become more liquid as nearly anyone can buy and sell shares and don't have to be particularly rich. Also the spread between the buy and the sell side is narrow, allowing more functional trading without affecting the share price dramatically unless the amount of stocks bought or sold is particularly large.

To avoid the bid-ask bounce described above, only companies having market capitalization larger than 10 million are included although this does not fully remove the possibility that some stocks may not trade each day. Limiting the company size should anyhow minimize this and to ensure that there is always pretty narrow spread between the buy and the sell side and the trade will not affect the quotation significantly. To keep calculation as simple as possible, 100 units is invested in the beginning. This means there might be only a fraction of some stock, which is not possible in normal trading as one stock is the minimum in most countries, but the portfolio performance is easier to

follow. To make the calculation as real as possible the weight of each stock has to be the same, not the number of stocks held. In case 15 stocks are purchased 100 is divided into 15 equal amounts which are then invested into each stock.

The holding period for the portfolio varies between three and 18 months after which the rebalancing is made according to the most recent rankings and another set of stocks is purchased. This process will continue as long as the time period of 10 years is reached. Some of the stocks might delist during the holding period and that has been handled so that the remaining value of that stock is zero. This will remove the possibility of look-ahead bias. The portfolio value is calculated for each three-month period even though the holding period might be longer. This enables better comparisons of average returns and average volatilities between the different holding periods and between the portfolio and the benchmark index.

3.2.3. Coding the excel

For this thesis an Excel macro has been built to automatically make the calculations when you type in the holding period and the number of stocks in a portfolio. Both key ratios were first formatted and checked so that excel can make the calculations without errors. The functionality of the code and excel itself has been verified to be reliable.

After receiving the number of stocks and the holding period, excel will sort the key ratios from the first time point and put the stocks in order of superiority after which a predetermined number of stocks will be copied to another sheet. A lookup function gets a price for each stock from another table. The amount of each stock is calculated so that the weight is equal in the beginning. To better see the progress in the value of a portfolio, in the beginning total value of investment is 100 units. Figure 6 below describes how the portfolio value is calculated.

Figure 6: Example of Portfolio Value Calculation

Company	Purchase price per 1 share	Number of Shares	Selling price per 1 share	Total price
PKC Group Oyj	177,34	0,113	150,06	16,92
Tieto Oyj	2704,82	0,007	2386,61	17,65
Mreal Oyj	165,30	0,121	167,34	20,25
Outokumpu Oyj	236,26	0,085	212,64	18,00
Rocla	112,78	0,177	111,13	19,71
Beginning Value	100		End Value	92,525
			Profit/Loss	-7,475

For the calculation purposes the beginning value is 100 and this may cause a number of shares to be a fraction. This could be handled by using a larger number as a beginning value and is not in relevance for that reason. In reality you are only able to buy whole numbers and the amount of stocks could differ a little bit from the precise weight.

The portfolio will be held as many periods as determined in the beginning and the end value will be calculated accordingly. The process is repeated with a loop function until the research period of ten years is fulfilled. The beginning value for the portfolio is now the end value of a previous period and this makes it possible to see the trend right away on each data point. At the same time value of the OMX Helsinki Cap index is shown for the comparison. Finally, after macro has finished the calculations, several figures are shown; total profit or loss for the whole period for the portfolio and index, geometric mean of the profits per period and annualized as well as the per period and annualized volatilities. The most important figures that will be analyzed and compared are annualized profit or loss and annualized volatility and total profit or loss during the whole period of ten years.

Geometric mean of three-month returns is calculated. Standard deviation is also calculated based on the same three-month returns and this can then be annualized for further comparison. GEOMEAN function was used in Excel to calculate period return for all the $n = 40$ periods and this was then adjusted to average annual return by the

following formula. If x_i denotes total return of period I, then geometric mean per period is $G = \sqrt[n]{x_1 x_2 \dots x_n}$ and an annual return is G^4 . 1-period standard deviation σ_T was calculated from the same quarterly returns that were used in previous calculation:

$$\sigma_T = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2}$$

This was then modified to annual standard deviation σ (volatility) satisfying $\sigma_T = \sigma\sqrt{T}$ with $T = 1/4$.

3.3. Trustworthiness of the study

Several aspects have to be considered when thinking about the reliability of the study. In this research taxes are omitted which naturally affects the real returns of the portfolios. Neither commission nor other costs related to trading are included in the simulations. Forming a portfolio is executed on pre-determined dates and this set process allows no personal judgment, for example if the date of purchase and selling appears to be in the middle of a huge decline in a market. There could be a possibility to postpone the purchase in a real life situation to get the stocks even cheaper later on in the future. Rebalancing obviously concerns only those stocks that are changing in the portfolio, if any of the stocks gets picked again only the amount should be bought or sold that will make the relative weight the same as other stocks. As data is downloaded straight from Thomson's databases there could be some mistakes that are impossible to verify since the amount of data is so extensive and some of the figures are so old that finding them online is not realistic.

4. FINDINGS

This chapter presents the findings on using Magic Formula to rank stocks and to form portfolios out of different sizes and maturities. Findings will compare returns with various holding periods to OMX Helsinki Capped GI and how volatility changes over time. The main research question was if this value investing method can create larger returns than the index. Another implication will be the comparison between top and bottom value stocks to see if there really is a major difference between the stocks. This would verify it is not a coincidence that a value portfolio outperforms the index, but it would show signs of value stocks actually being better when it comes to future earnings. Performances of the Magic Formula portfolios are also compared with portfolios that include stocks with low Price-to-Book ratio, as well compared with portfolios that use composite value measure of Magic Formula and P/B.

4.1. Performance of value portfolios

Portfolios formed by choosing the best stocks based on two value ratios and holding same position for varying time periods, turned out to be very successful in the Finnish market. Table 1 below presents the average annualized returns of six different portfolios as well as the return of OMX Helsinki Cap Growth Index which was selected as the benchmark for this study. The value portfolios include either five, ten or fifteen stocks, and to really capture the difference, three similar portfolios were formed at the bottom ranking stocks. In addition two other five stock portfolios were compared; one with the stocks ranked 6-10 (Value6-10) and another with the stocks ranked 11-15 (Value11-15) from the top. This should validate there is a difference between the best and the worst stocks.

Even a quick look at the Table 1 proves the ranking actually works and that all the 18 best value portfolios clearly outperform the benchmark index. The biggest annual return is achieved by picking five top ranked stocks and holding those for half a year after

which ranking is repeated and another top five stocks are chosen. This will then be repeated for the ten-year period. Average annual return on such portfolio is 20% when in comparison the OMXH index only has a return of 3.5% annually. The six-month holding period is working well on the 10-stock portfolio too, but the annual return is already nearly four percentage points weaker, still beating the market by more than 12%. There is no clear pattern on what holding period or size of the portfolio would be significantly better than the rest of them, but small evidence can be found that portfolios held from three to nine months yield more than longer periods. Transaction costs are left outside from this study, but they still play an important role since shorter holding periods and portfolios with more stocks would mean increased expenses and that would even up the profits. Difference between returns on portfolios and the index is so outstanding that transaction costs are not considered meaningful. Unlike previous studies (Lakonishok et al. (1994), Bird and Whitaker (2003), Rousseau and van Rensburg (2003) and Bird and Casavecchia (2007)) suggest, a longer holding period does not necessarily mean larger revenues. With these value ratios, the case seems to be rather opposite; shorter holding periods yield better after which returns start decreasing when the holding period becomes longer.

Table 1 indicates how poorly stocks that have ranked the worst perform compared with both the benchmark index and especially the best portfolios. Not a single portfolio out of 18 can even reach the return of the index and only two alternatives get positive return on a ten-year holding period. The biggest loser is a portfolio where the worst five stocks are selected and rebalancing is made every three months; an annual yield of this portfolio is -12.8%. This obviously picks the truly bad performers each time. As soon as the holding period is lengthened returns are soothing a little bit, still making negative returns but only around three to nine percent.

To see how different top ranked stocks perform, two other 5-stock portfolios were formed and compared with other portfolios, especially to the best 5-stock portfolio. Interesting observation is that the portfolio Value6-10 performs nearly worse in all holding periods, except one, that is 15 months, while the Value11-15 was superior on four out of six periods, compared with all the value portfolios. Based on this notion,

stocks on average perform better if they are ranked on top rather than on the bottom but there might be large differences between individual stocks.

Table 1: Average Annualized Returns of Portfolios and Index

Holding period	3 months	6 months	9 months	12 months	15 months	18 months
Best 5	17,2 %	20,0 %	17,3 %	13,9 %	9,4 %	13,2 %
Best 10	15,1 %	16,2 %	13,8 %	10,1 %	14,5 %	11,1 %
Best 15	17,2 %	16,7 %	16,1 %	13,4 %	11,0 %	13,4 %
Worst 5	-12,8 %	-3,2 %	-8,1 %	-3,9 %	-2,9 %	3,2 %
Worst 10	-12,3 %	-8,2 %	-4,4 %	-5,4 %	-3,1 %	0,9 %
Worst 15	-10,8 %	-9,1 %	-8,1 %	-5,6 %	-0,2 %	-1,6 %
Value6-10	11,9 %	11,5 %	9,8 %	5,6 %	17,9 %	8,4 %
Value11-15	20,1 %	15,8 %	19,1 %	18,2 %	2,5 %	16,0 %
OMXH Cap	3,5 %					

A statistical hypothesis test was conducted to observe the differences between the means of the index and a one chosen value portfolio. The value portfolio in this comparison consisted of five stocks and the holding period observed was six months. This portfolio was chosen since it had the highest average return of basic portfolios at the top section of Table 1. Null hypothesis was that index return – value portfolio return ≥ 0 and alternative hypothesis was that index return – value portfolio return < 0 . The significance level was set to 0.05.

Table 2 presents the findings of t-test. One-tail P value is 0.003 which is under the significance level and therefore the null hypothesis is rejected. The results suggest that index will very seldom have the higher return than the value portfolio in this comparison. Reason why the means of the variables are different than in the Table 1 is that t-Test calculates arithmetic means whereas results in Table 1 are geometric means.

Table 2: One-tailed t-test

t-Test: Paired Two Sample for Means

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	0,01685	0,05317
Variance	0,01662	0,01425
Observations	40	40
Pearson Correlation	0,79994	
Hypothesized Mean Difference	0	
t Stat	-2,90619	
P(T<=t) one-tail	0,00300	
t Critical one-tail	1,68488	

Like many studies before have indicated, the riskiness of successful portfolios does not seem to be any higher than the index, so extra returns cannot be explained by that. Volatility of the OMXH Cap index during the ten-year period has been 25.79% (Table 3). Portfolios that generate returns over 10% higher annually are equally risky when comparing the average yearly standard deviation between index and value portfolios. Nevertheless, this holds true only when regarding the top value portfolios, since the volatility of portfolios with the bottom ranked stocks exceeds both the index and the top portfolios significantly. The highest yearly standard deviation of returns on top the ranked value portfolio is 27.4% but it is only less than two percentage points larger than the index volatility, whereas the largest volatility for the bottom ranked portfolio is 39.6%. In addition this portfolio has the poorest return of -12.8% so it is not only risky but also losing more money than any other set of stocks. Most of the portfolios

consisting of stocks that are ranked at the bottom have volatility larger than the index even though the return is also negative in most of the cases.

Among three portfolios with top ranked stocks, the holding period does not really make a difference unlike previous studies have suggested, as it remains rather constant all the time besides a few exceptions. 10- and 15-stock portfolios have a little bit higher volatility on a three-month holding period but periods longer than that decrease it closer to 25% which seems to be near the average and the volatility of the index as well. Picking up ten stocks and holding the portfolio for one and a half year would seem a relatively smart choice as the volatility is only 21.8% yet annual return is around 11%, and the index is beaten threefold on profits but risk is somewhat smaller.

The riskiness of the two additional five stock portfolios seems to be more in line with the overall results that portfolios with lower ranked stocks have higher volatility. Even though the return of the Value11-15 portfolio was the highest in four periods, volatility was also remarkably high as it was more than 31% in all periods. Also the Value6-10 portfolio had very high volatility regardless of poor returns compared with other value portfolios.

Table 3: Average Annualized Volatilities of Portfolios and Index

Holding period	3 months	6 months	9 months	12 months	15 months	18 months
Best 5	25,1 %	23,9 %	24,2 %	25,8 %	25,5 %	25,4 %
Best 10	27,4 %	24,5 %	23,9 %	25,4 %	25,1 %	21,8 %
Best 15	27,3 %	25,3 %	25,6 %	26,1 %	24,8 %	24,9 %
Worst 5	39,6 %	37,0 %	38,6 %	36,3 %	34,9 %	34,2 %
Worst 10	33,3 %	31,6 %	30,7 %	30,6 %	27,5 %	27,8 %
Worst 15	31,3 %	29,1 %	28,3 %	26,9 %	29,1 %	25,3 %
Value6-10	33,0 %	28,2 %	26,1 %	27,8 %	28,5 %	21,2 %
Value11-15	32,0 %	31,3 %	32,5 %	31,1 %	31,1 %	34,6 %
OMXH Cap	25,79 %					

At this point it is rather clear that value premium does exist and the best stocks actually get really good returns on average. Some studies concluded (e.g. Rosseau and van Rensburg; 2003) that a few of the stocks make the most of the returns and that could definitely be the case. To find more evidence backing up the previous results and to see if the better stocks really rank at the top and the worst at the bottom, simulation was also conducted so that a portfolio was composed of the best 50 stocks and the worst 50 stocks. An average annual returns and volatilities for three-month, twelve-month and eighteen-month holding periods can be found on the Table 4 below.

Returns for the top ranked stocks are not as high as for smaller portfolios but they still exceed clearly both the index and the bottom ranked stocks. The three-month holding period generates the annual average return of 12.4% for top portfolio while the portfolio with the stocks from the bottom yields -0.7%. For longer periods also poor portfolios

have some positive returns even though not nearly as good as the good portfolios. By holding the 50 bottom ranked stocks and changing them every 18 months the return is pretty close the returns on the benchmark index and even the volatility is smaller now. The volatilities in general are more or less constant as there is only 1.5 percentage point difference between extremes on both the good and the poor portfolios.

Table 4: Annual Return and Volatility of 50-stock Portfolios

Holding period		3 months	12 months	18 months
Best 50 stocks				
	Annual return	12,4 %	7,6 %	8,78 %
	Volatility	25,1 %	24,3 %	23,91 %
Worst 50 stocks				
	Annual return	-0,7 %	2,3 %	3,41 %
	Volatility	24,3 %	24,3 %	22,70 %

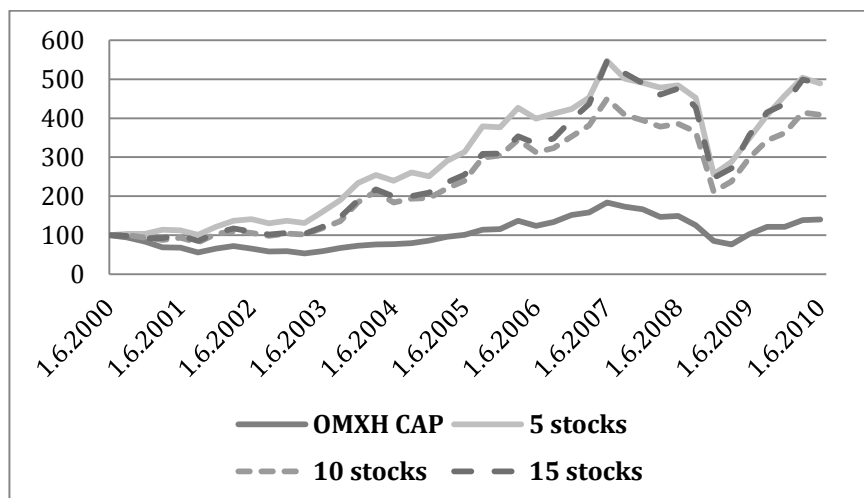
To see how individual stocks perform, an average return was calculated for each period for all the stocks listed during that period and that was compared with an average of the top ten stocks each period. Out of 40 three-month periods 70% of the time the average of ten best ranked stocks exceeded the average of all stocks. So it seems reasonable that value portfolios perform better along the study. What was interesting to find out is that when comparing the average return of the best and the worst ten stocks, the best stocks had higher returns by only 72.5% of the time. What explains this is that when the top stocks were better, the difference was more than 11% on returns while the worst ranked stocks were only 6% better. Other than that individual stocks did not show any particular pattern or at least detecting this issue would need more thorough research. There were both good and bad performers at the top of the ranking so a more crucial factor seems to be the better average performance of value stocks that rank the highest, based on the value method used in this study.

4.2. Holding period and Portfolio size

The number of stocks and the holding period affects the performance of a portfolio as seen before and these six figures below show the indexed performance of each portfolio more accurately as the whole time frame of 10 years is shown. The beginning of the 21st century was a period of a steady growth for most of the portfolios and only a very few of them went under the beginning value of 100 during the first years. Few years later a more rapid rise begun. Financial crisis in 2008 left a mark for all the portfolios and they suffered from the collapse of economy really hard. According to Pätäri and Leivo (2009) the same value ratios that picked up the best performers during the bull market, also were the ones that lost least value in a bear market. Figures below do not really answer this observation but it seems like the best performing portfolios might lose even more of their value than the portfolios with poor performance. This would be an interesting topic for further study as there seems to be multiple good ratios for building a portfolio for bull markets but fewer studies have been conducted on bear markets.

When the best portfolio is chosen only based on returns, in Figure 7 both 5-stock and 15-stock portfolios would earn back the initial investment almost five times where the 10-stock portfolio four times the amount invested. OMXH Cap growth index is hardly above the beginning value after ten years even though it includes dividends.

Figure 7: 3-month portfolio value



In Figure 8 and Figure 9, all the portfolios follow similar pattern even though the 5-stock portfolio dominates 6-month and 9-month holding periods for the whole time period.

Figure 8: 6-month portfolio value

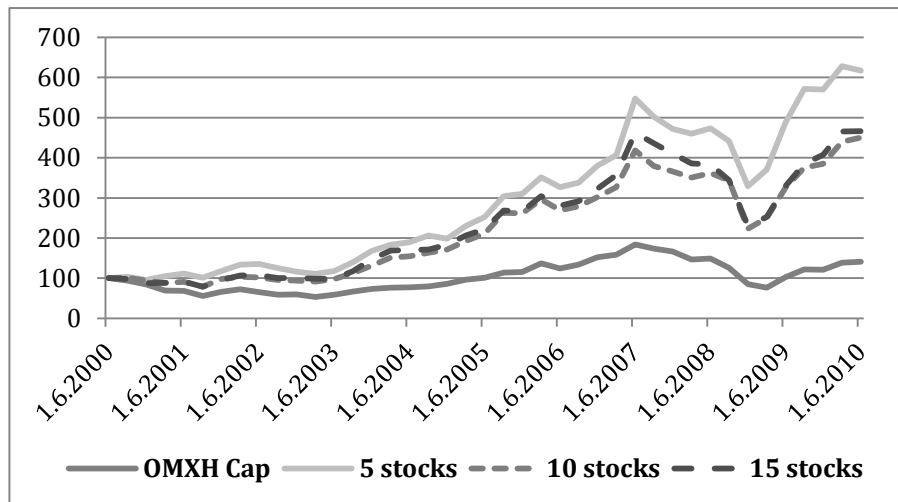
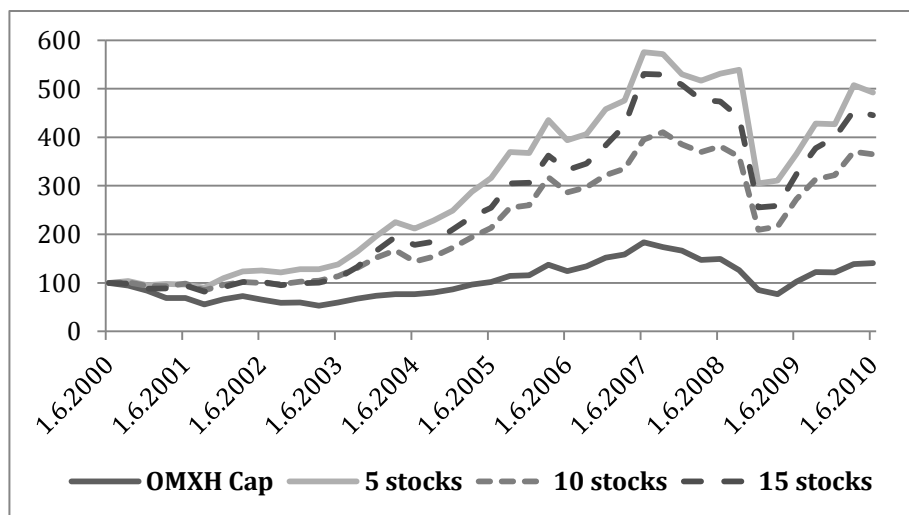


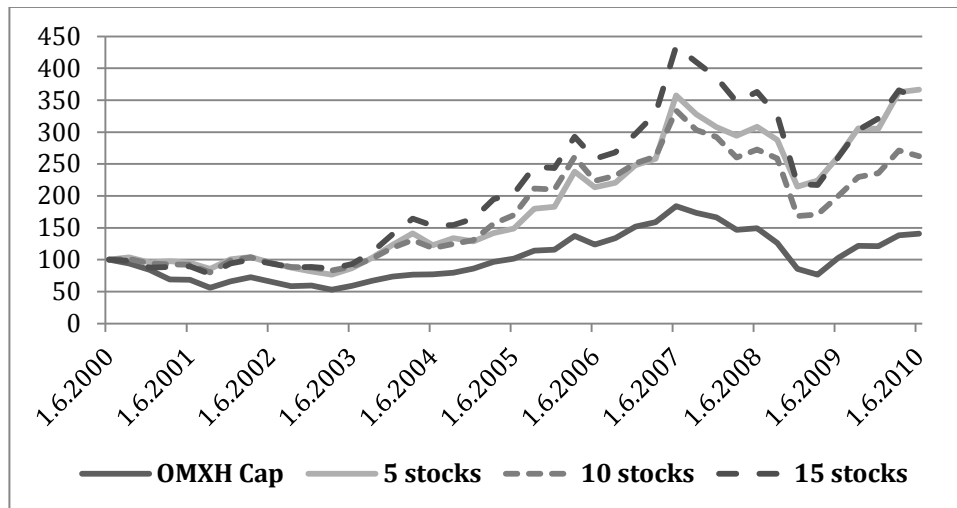
Figure 9: 9-month portfolio value



After holding the same stocks for a year or longer, larger portfolios begin to perform relatively better even though the smallest portfolio still performs as well as 15-stock portfolio at the end but along the way the 5-stock portfolio is not as good. This Figure

10 demonstrates that large portfolio of 15 stocks loses more value during the crash than the small one, after which both perform equally rest of the time.

Figure 10: 12-month portfolio value



15 months is the only holding period where the 10-stock portfolio performs better than the two other portfolios in this comparison. It is rather clear that some individual stock's performance makes a huge difference depending on the holding period, since the figures are so diverse. The common patterns only include the similar downturn and the upturn during the financial crisis and that all the portfolios outperform the benchmark index.

Figure 11: 15-month portfolio value

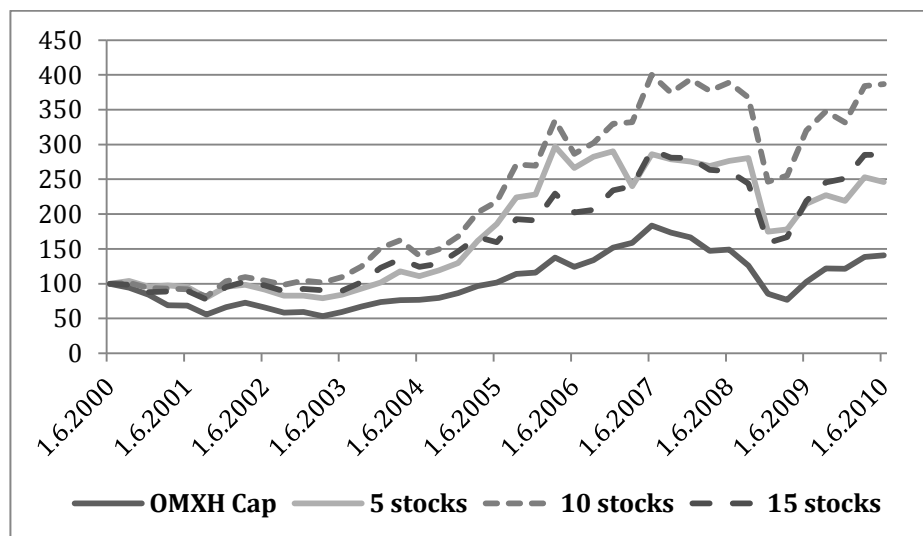
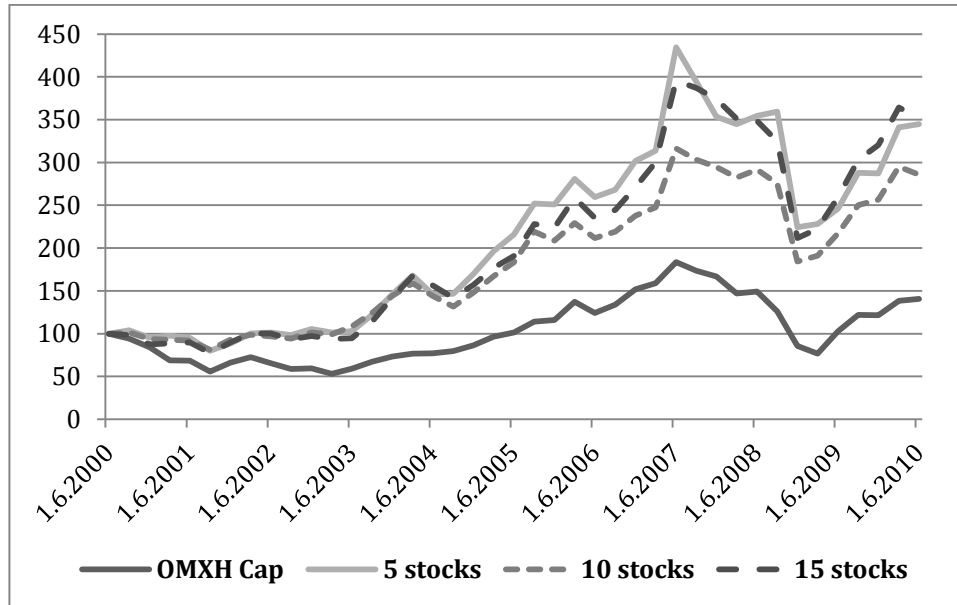


Figure 12: 18-month portfolio value

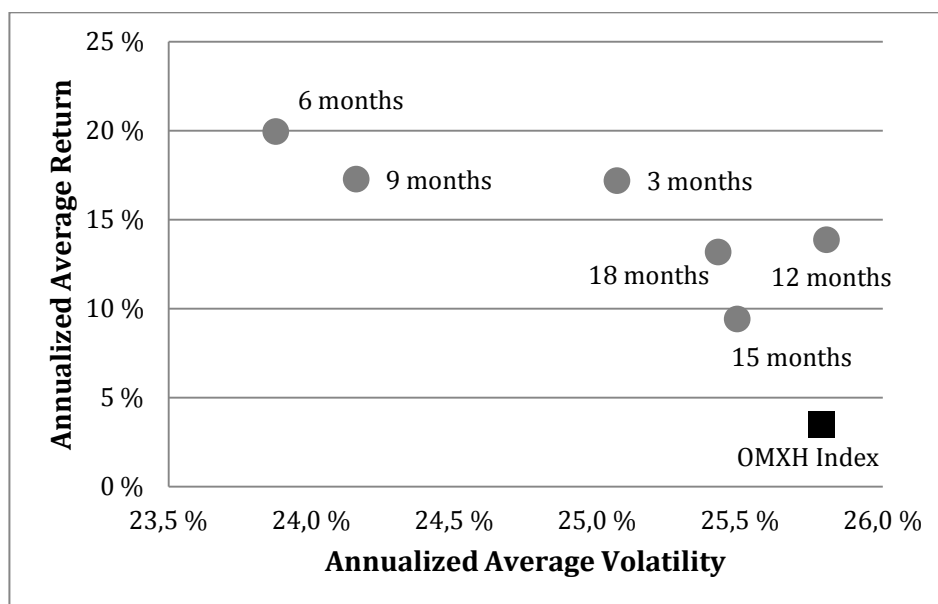


4.3. Return and Volatility of Value Portfolio

The following three figures describe the return risk positions of all the 18 value portfolios against the benchmark portfolio and between each other. The results are quite different depending on how many stocks there are in the portfolio. According to the general assumptions in finance, the figures should show a positive correlation between risk and return and as efficient market hypothesis suggests the only way to get more return is to tolerate more risk. Figure 13 suggests that by holding a portfolio with five stocks, correlation seems to be totally opposite, similar negative correlation can be found the study of Pätäri and Leivo (2009) where they have compared several value and glamour portfolios. Investing in five stocks and holding the portfolio for six months, returns are the best among the comparison group and at the same time volatility is the smallest making it a very sound investment. On the other hand the OMXH Cap index returns are only less than four percent annually but the volatility is nearly the highest of all. There are no good reasons explaining this but it would appear that the basic notion of positive correlation do not always hold. One explanatory issue could be the basis how OMXH Cap index is formed, as it includes all the companies in Helsinki Exchange

so that the maximum value of one stock is limited to 10%. The performance of the index is still dominated by the largest companies. Several reasons were presented in literature review (Hong and Stein, 1999, Dhatt, et al. 1999 and Lakonishok et al. 1994) why larger companies are more popular and followed by analysts, and therefore less likely to be value stocks.

Figure 13: Return-risk positions for 5-stock portfolios



In Figures 14 and 15, the correlations between the two dimensions, the risk and the return, is not as evident but it can still be found. All the portfolios with either 10 or 15 stocks are above the index when comparing the returns, whereas some of them are more or less riskier. It is now much harder to tell which one of the value portfolios has the best in risk reward –ratio as there is no evident pattern. The three-month holding period is the most volatile in both figures and the 18-month holding period is either the least or the second least volatile. This is in line with the previous literature; longer holding periods provide steadier returns and it is harder to know what will happen in the short run as the good stocks most likely will perform well in the long run but not necessarily right away.

Figure 14: Return-risk positions for 10-stock portfolios

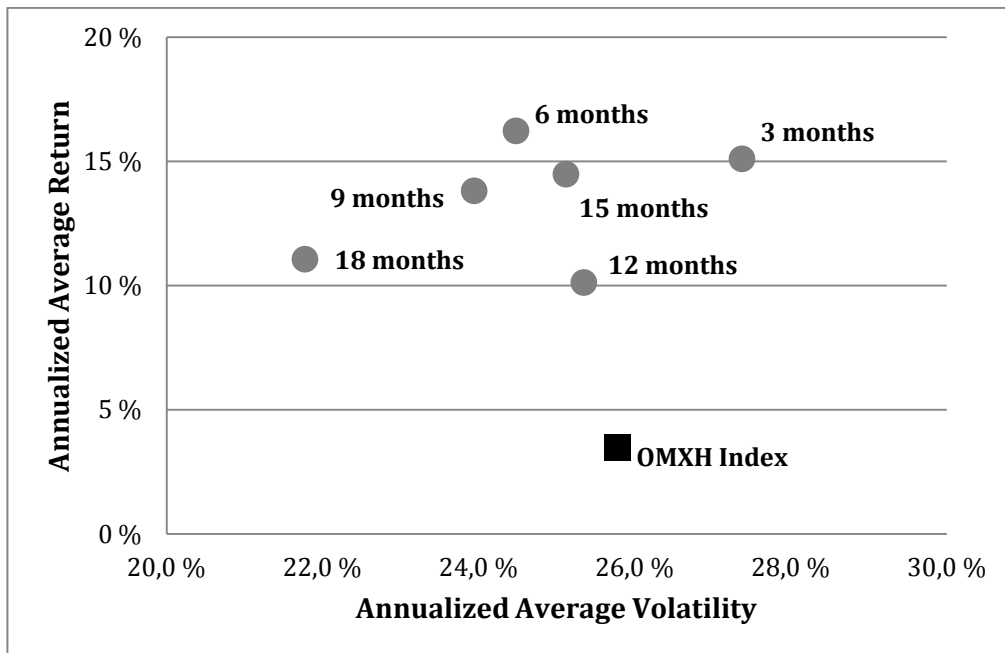
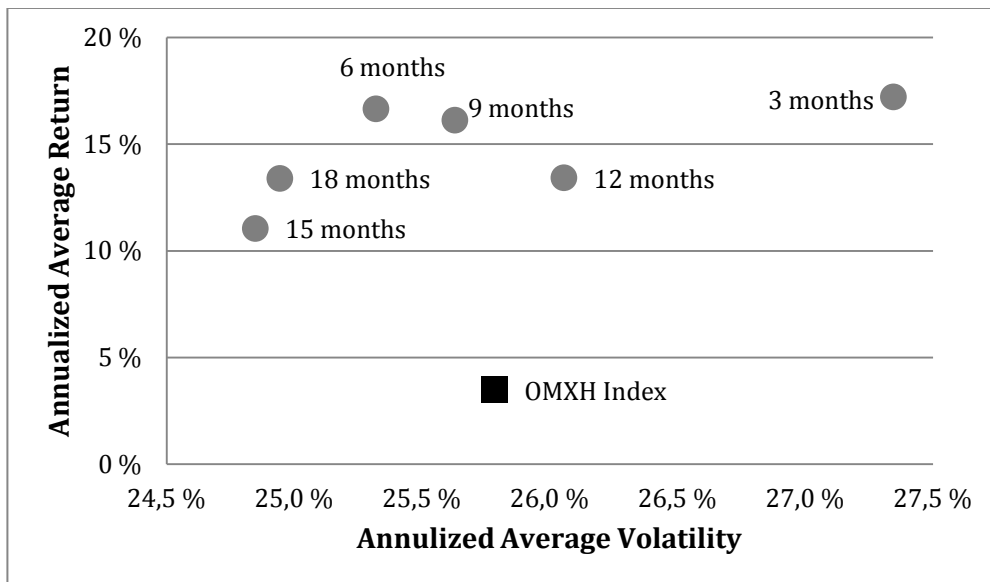


Figure 15: Return-risk positions for 15-stock portfolios



There are no notable correlations between the risk and the return on the Value6-10 or Value11-15 portfolios. One thing though is common for both of these; all the holding periods except one have higher standard deviation than the benchmark index. With

these two portfolios, capital allocation line holds rather well, unlike previous cases have shown. In Figure 16 differences are to some degree smaller and one portfolio is less volatile than OMXH Cap index, but Figure 17 shows that portfolios have much larger volatility and one portfolio has even smaller average returns than the index.

Figure 16: Return-risk positions for 5-stock portfolios – Value6-10

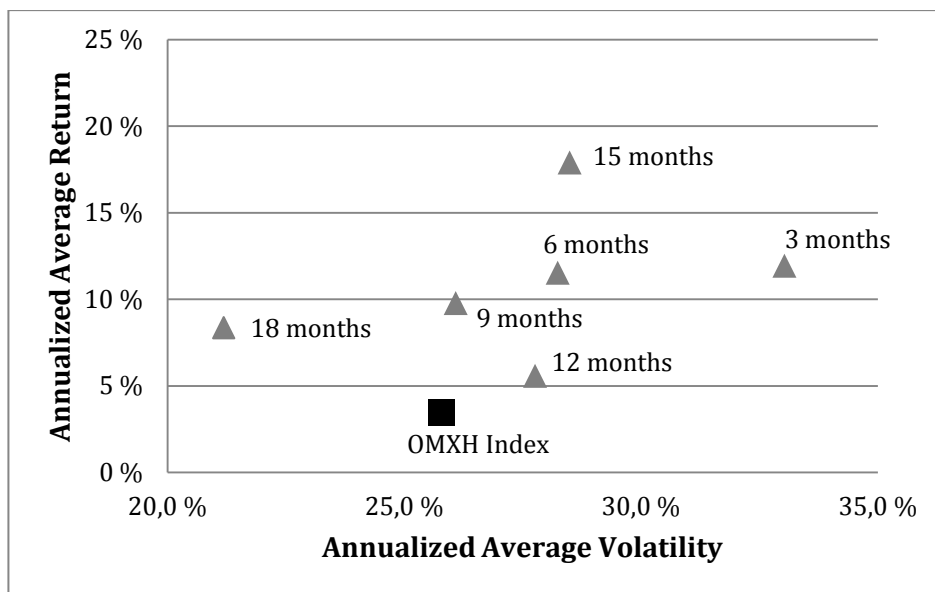


Figure 17: Return-risk positions for 5-stock portfolios – Value11-15

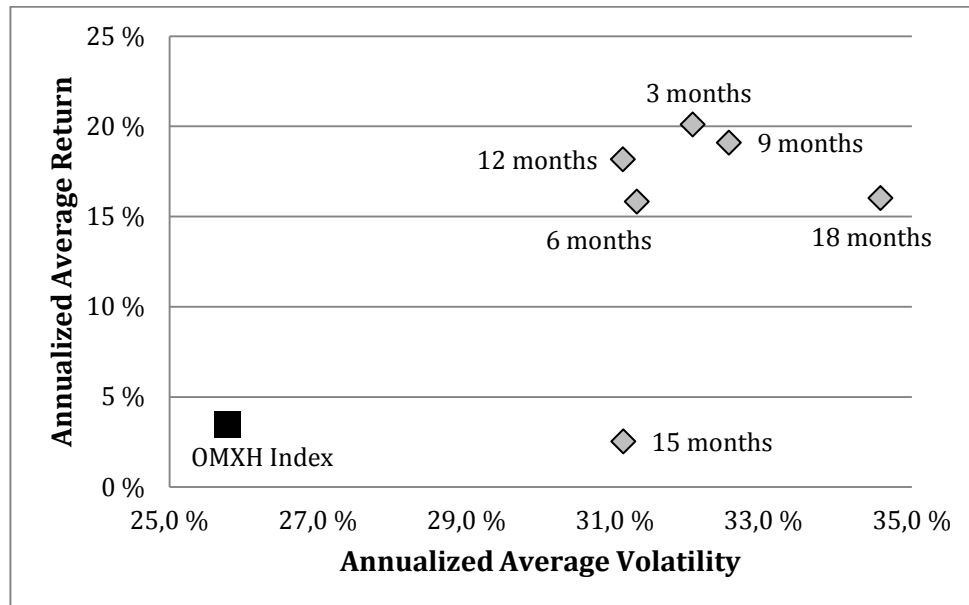
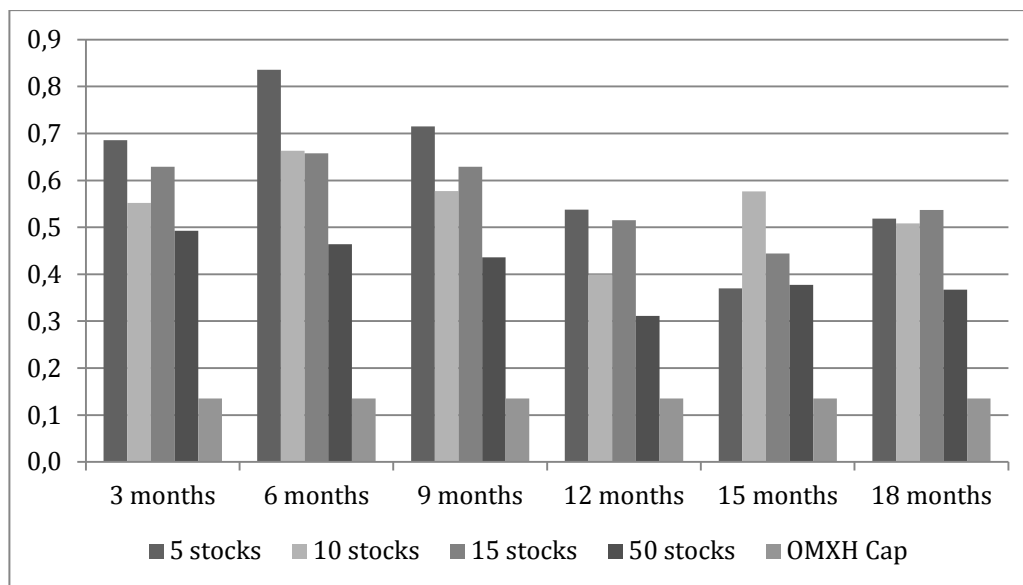


Figure 18 presents ratios of return and volatility and it puts all the different portfolios on the same line as they are now comparable between each other. A larger number indicates better risk reward –ratio and if efficient markets existed, there would be no differences between portfolios. However, this thesis does not take into account the size effect, if such exists, but like Pätäri and Leivo (2009) indicated, there were no evidence of such in the Finnish market.

Analysis of Figure 18 suggests that holding the same portfolios over nine months decreases the risk reward -ratio, so smaller periods should be preferred, unlike some previous studies suggest. Differences between short and long holding periods would be evened out if transaction costs were added. It would become more expensive to change the position every three or six months, so the larger the portfolio, the effect would be even bigger. The winner of all combinations is holding five stocks for six months at the time; this would not cause too big transaction costs either. Anderson and Brooks (2007) examined stocks in the London stock exchange and found the ideal portfolio to be six stocks and holding period 1 year although they did not study periods shorter than this. The smallest portfolio size consisting of five stocks is the best when the time period is between three and twelve months so out of six holding periods this will be the most

preferred one if both risk and return are considered. After one year, the portfolios with 10 and 15 stocks become more successful while the largest one with 50 stocks, which was taken to this comparison as well, seems to be performing worse all the time, even though beating the index on all holding periods.

Figure 18: Return to Volatility –Ratio



4.4. Comparison of Magic Formula and Price-to-Book ratio

Price-to-Book ratio is used a lot to separate value stocks from growth stocks. A high ratio means that company's market value is higher compared to a book value and which is typical for growth stocks. Future earnings are considered to be large as it was in techno bubble when much of the companies were valued multiple times higher than their book value suggested them to be. Value stocks on the other hand are considered to be undervalued by investors which makes them attractive in the eyes of value investor.

Comparison of Magic Formula and Price-to-Book value was conducted to identify if Magic Formula can perform better than a simple value measure, since some studies (Dhatt, et. al, 1999 and Pätäri and Leivo, 2009) suggested composite value portfolios

could earn even better returns than individual ratios. The same holding periods than before were analyzed and P/B portfolio was created from the low value P/B stocks. Two other portfolios were formed based on the combination of Magic Formula and Price-to-Book value. The first portfolio consisted of Magic Formula stocks with low P/B value and the second included magic Formula stocks with high P/B value. Table 5 below presents the returns of all these four portfolios and Table 6 shows the volatilities of the same portfolios.

Similar to the research by Piotroski (2000) portfolios that have been formed based on the low P/B values perform rather well and earn higher returns than the index in average. Still, these portfolios seem to have smaller returns than Magic Formula in nearly all the different scenarios. It also has higher standard deviation most of the times. This indicates that P/B alone is not as sufficient valuing method as the Magic Formula.

More interesting results can be achieved when these two methods are combined. When stocks that rank high on Magic Formula and have low Price-to-Book value are chosen, results become even better than if only Magic Formula is used. Based on these six different holding periods and three portfolio sizes, the combination of these two measures outperforms the Magic Formula more than 80% of the time. Especially when there are ten or fifteen stocks in the portfolio, the return is considerably higher. Combining these two methods has indeed an effect, since portfolios including stocks that rank well on Magic Formula but have a high Price-to-Book value do not perform nearly as well. Almost half of the time the performance is even worse than with portfolios where ranking is based only on low P/B. Still, both of these composite portfolios have something in common, as returns become larger when more stocks are included into the portfolio. Holding periods between three and nine months should be preferred as these generate slightly larger returns on average even though there are a couple of exceptions.

Table 5: Comparison of Value portfolios - Returns

Holding Period	3 months	6 months	9 months	12 months	15 months	18 months
5 stocks						
MagicFormula	17,2 %	20,0 %	17,3 %	13,9 %	9,4 %	13,2 %
Price-to-Book Low	8,5 %	8,4 %	7,0 %	9,6 %	13,6 %	11,1 %
MagicF&Low P/B	15,2 %	19,3 %	18,2 %	18,2 %	3,0 %	19,9 %
MagicF&High P/B	9,6 %	7,2 %	18,6 %	0,8 %	5,2 %	4,6 %
10 stocks						
MagicFormula	15,1 %	16,2 %	13,8 %	10,1 %	14,5 %	11,1 %
Price-to-Book Low	10,3 %	9,6 %	11,2 %	8,4 %	9,3 %	11,0 %
MagicF&Low P/B	19,2 %	19,9 %	20,4 %	19,8 %	11,7 %	16,9 %
MagicF&High P/B	13,9 %	10,3 %	11,7 %	2,4 %	8,7 %	4,0 %
15 stocks						
MagicFormula	17,2 %	16,7 %	16,1 %	13,4 %	11,0 %	13,4 %
Price-to-Book Low	7,0 %	6,1 %	5,8 %	5,5 %	9,7 %	6,9 %
MagicF&Low P/B	22,5 %	22,8 %	20,1 %	19,8 %	16,3 %	18,5 %
MagicF&High P/B	14,4 %	11,7 %	8,6 %	6,0 %	9,9 %	6,3 %

Table 6 presents volatilities of previously discussed four portfolios. In general volatilities do not differ considerably as they are between 25% and 30% most of the time. Yet, there can be seen some patterns as Magic Formula portfolios have the lowest volatility if five or ten stocks are included into the portfolios. Another observation is that volatilities of both new composite portfolios (i.e. Magic Formula & Low P/B and Magic Formula & High P/B) follow more common pattern that larger portfolios are less risky.

When judging the portfolios based on both the return and the risk, Table 7 summarizes the findings. The combination of Magic Formula and low P/B stocks outperforms the other portfolios clearly if ten or fifteen stocks are included in the portfolios and if the holding period is less than a year. The plain Magic Formula portfolio is superior on a short holding period and if there are only five stocks in the portfolio. All the composite

portfolios, where more than one ratio is used, perform better than the portfolio that is ranked by the P/B only.

Table 6: Comparison of Value portfolios - Volatilities

Holding Period	3 months	6 months	9 months	12 months	15 months	18 months
5 stocks						
MagicFormula	25,1 %	23,9 %	24,2 %	25,8 %	25,5 %	25,4 %
Price-to-Book Low	30,6 %	29,7 %	28,3 %	27,0 %	28,9 %	28,6 %
MagicF&Low P/B	28,8 %	28,3 %	30,1 %	32,2 %	25,2 %	27,0 %
MagicF&High P/B	31,6 %	28,0 %	28,7 %	29,5 %	28,7 %	28,5 %
10 stocks						
MagicFormula	27,4 %	24,5 %	23,9 %	25,4 %	25,1 %	21,8 %
Price-to-Book Low	27,0 %	26,6 %	26,3 %	25,8 %	26,6 %	26,5 %
MagicF&Low P/B	26,3 %	28,1 %	29,0 %	29,6 %	23,4 %	29,0 %
MagicF&High P/B	30,4 %	25,2 %	26,3 %	26,0 %	28,0 %	24,6 %
15 stocks						
MagicFormula	27,3 %	25,3 %	25,6 %	26,1 %	24,8 %	24,9 %
Price-to-Book Low	26,3 %	26,7 %	26,0 %	25,1 %	26,7 %	26,5 %
MagicF&Low P/B	25,3 %	24,9 %	25,7 %	25,3 %	23,6 %	25,9 %
MagicF&High P/B	27,8 %	24,8 %	25,7 %	26,5 %	26,9 %	25,4 %

Table 7: Return-risk ratio of value portfolios

Holding Period	3 months	6 months	9 months	12 months	15 months	18 months
5 stocks						
MagicFormula	0,69	0,84	0,72	0,54	0,37	0,52
Price-to-Book	0,28	0,28	0,25	0,35	0,47	0,39
MagicF&Low P/B	0,53	0,68	0,60	0,57	0,12	0,73
MagicF&High P/B	0,30	0,26	0,65	0,03	0,18	0,16
10 stocks						
MagicFormula	0,55	0,66	0,58	0,40	0,58	0,51
Price-to-Book	0,38	0,36	0,43	0,33	0,35	0,42
MagicF&Low P/B	0,73	0,71	0,70	0,67	0,50	0,58
MagicF&High P/B	0,46	0,41	0,44	0,09	0,31	0,16
15 stocks						
MagicFormula	0,63	0,66	0,63	0,52	0,44	0,54
Price-to-Book	0,27	0,23	0,22	0,22	0,36	0,26
MagicF&Low P/B	0,89	0,92	0,78	0,78	0,69	0,72
MagicF&High P/B	0,52	0,47	0,34	0,23	0,37	0,25

5. CONCLUSIONS

5.1. Research summary

The main objective of this study was to find out if certain value investing method could be used for ranking stocks and picking up the best in order to outperform the benchmark index in the long run. The other objectives were to find the optimal portfolio size and the optimal holding period to maximize returns and finally adjust the returns with risk and select the best portfolio based on the risk reward –ratio.

The results verified findings from previous literature that value premium exists, and in the Finnish market it was evident this particular method worked well. Taxes and transaction costs were excluded from this study so in reality this would decrease returns but it does not invalidate the findings totally as transaction costs are only a fraction of the turnover and taxes account less than one third of the profit. By adding those stocks with low Price-to-Book ratio to Magic Formula, returns became even higher while the risk remained relatively low, compared to other value portfolios or the benchmark index.

For the shorter time periods than 12 months, the 5-stock portfolio outperformed both the index and all the other portfolios that used only Magic Formula for ranking. Also, the returns in general were better for the portfolios rebalanced more often which was against some previous findings that longer holding period would result in more constant and better annual yield. When the holding period was longer than a year, portfolios with either 10 or 15 stocks performed better or at least as well as the smallest one. The OMXH Cap, which was the benchmark index for this study had an average annual yield of 3.5% while value portfolios had between 9.4% and 20% depending on the holding period and number of stocks selected. It is not useful only to compare the returns of different stocks or portfolios, but also the risks have to be taken into account. The efficient market hypothesis suggests that there is a trade-off between return and risk, and it is impossible to an individual investor to beat the market in the long run without taking more risk. Many studies, including this research, have shown that volatility could be even smaller with value portfolios than it is with glamour portfolios or in this case with the stock index. The OMXH Cap had nearly as large standard deviation as value

portfolios even though returns were poor. Previous studies have suggested that small portfolios have higher standard deviation which was not really the case in this research.

To conclude, the Magic Formula seems to be working very well in every holding period analyzed in this research, especially when low Price-to-Book stocks are chosen. The method itself is simple, but it takes some effort to get all the data needed for ranking the stocks.

5.2. Practical implications

The findings of this research as well as previous studies should undeniably give an idea how to utilize these value investing methods as a part of portfolio selection at least in a supporting way. Some new ideas for company analysis could be learned from this method as the results are rather promising. By screening the most promising stocks with this method and maybe combining some other factors or momentum indicator, one could rule off the weak companies, and then the final selection could be done amongst the companies left. Especially if the original sample is for example the whole Europe, some first round screening could be made with this. The biggest problem might be where to get all the data needed, as it might take a while if separately picked from the quarterly reports.

5.3. Limitations of the study

Due to the extensive amount of data that has been used in this study, there might be defects in the logic or data that have not been spotted. The Finnish market is a rather small one in comparison to many others so based on the results of this research alone it should not be expanded into other markets in a belief of similar returns. Even though this method seems to be working very well, not only according to this study but others as well, personal judgment has to be used when making investment decisions. Past performance is not a guarantee for future returns, which has to be kept in mind.

5.4. Suggestions for the further study

Adding a momentum indicator and comparing the results with this method of ranking stocks would be an interesting study. It is clear that stocks chosen by this method give rather impressive returns, but when the returns actually take place is uncertain. A momentum indicator could help timing the purchase and choosing the most prominent of these value stocks. Also the comparison of this value investing method to some other value strategies than Price-to-Book ratio would be exciting. Same Finnish data could be used to see if one of the individual ratios or some other composite value measures, like Pätäri and Leivo's (2009) would get better results. The optimal number of stocks could be studied even more precisely as the study by Anderson and Brooks (2007) suggests, holding less than ten stocks achieves the best returns.

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APPENDICES

Appendix 1

Appendix 1 is a small side study of how stocks ranked by value method in this research rank based on more common ratios used for ranking stocks, such as Price-to-Earnings, Book-to-Price and Dividend-to-Price. This was not included into research questions as it does not really relate to holding periods or portfolio size but it could still give some new ideas how and if different value ratios have anything in common.

Purpose of this comparison is to see if value stocks are above or below the average based on three ratios mentioned above. Comparing all the portfolio sizes and holding periods separately would have caused overlapping calculations, since 10-stock and 15-stock –portfolios have the same 10 stocks, comparison of these ratios was concluded following so that top 20% of stocks each period were compared to whole data. All the three ratios were calculated for 40 periods for those companies that were in the rankings in origin research, number of stocks varied from 50 to 124. An average was taken from the whole sample and then top 20% of stocks were compared to that. In this case for P/E ratio top 20% of those stocks ranked by magic formula were chosen to see how many of these stocks' P/E is under the average. Similar investigation was made for all the three ratios and total of 40 periods. Table 8 below presents the findings. Three different measures for average, average, median and mode, were taken to get better and hopefully more reliable results. Since not all stocks had values results are calculated so that number of observations below/above average is divided by number of observations that has value other than blank.

Results suggest that stocks that are ranked the highest by Magic Formula have smaller P/E than average. This is no surprise, since one of the two ratios the Magic Formula uses is earnings yield, which is nearly the same as reciprocal of P/E; only difference is net debt which has been added to market value in earnings yield. An interesting observation is that at some period 100% of the stocks picked by magic formula are below the average whereas occasionally none of them are below. This could be a topic for further research to see if there is an identifiable pattern behind this.

Both book-to-price (B/P) and dividend-to-price (D/P) give slightly more constant figures along the periods, standard deviations of results 13% and 18% compared to 36% on P/E. Results on B/P suggest that only 30% of the stocks ranked top by magic formula are value shares and most of them, 70% are growth shares. Last ratio magic formula was compared against is D/P and results were nearly even as 45 to 50 percent of stocks were paying more dividends than average. To see if any relation could be found, correlation of each ratio was calculated against per period return of benchmark index, to get an idea if some of these ratios could be used for picking better stocks in different market conditions. The correlation was negative with P/E (-0.26) and B/P (-0.33), and positive for D/P (0.03). However, all the results are far from ± 1 which indicates there is no correlation between the two numeric variables.

Table 8: Comparison between magic formula and three other ratios

P/E = how many under average B/P = how many over average D/P = how many over average				
Period	P/E	B/P	D/P	OMXH Cap return
1	100 %	75 %	0 %	-5,8 %
2	100 %	67 %	50 %	-10,7 %
3	100 %	33 %	0 %	-18,1 %
4	100 %	22 %	100 %	-0,5 %
5	88 %	33 %	50 %	-18,5 %
6	89 %	35 %	0 %	18,5 %
7	94 %	14 %		9,8 %
8	72 %	38 %	25 %	-9,9 %
9	50 %	25 %	46 %	-10,6 %
10	70 %	30 %	53 %	1,5 %
11	67 %	33 %	60 %	-10,5 %
31	71 %	29 %	44 %	-11,8 %
32	96 %	26 %	33 %	1,5 %
33	43 %	35 %	57 %	-15,5 %
34	65 %	30 %	48 %	-32,1 %
35	95 %	32 %	64 %	-10,2 %
36	23 %	14 %	47 %	33,6 %
37	0 %	5 %	53 %	18,8 %
38	0 %	19 %	47 %	-0,4 %
39	45 %	14 %	42 %	13,9 %
40	87 %	0 %	44 %	1,7 %
Mean	63 %	29 %	45 %	
Median	72 %	29 %	47 %	
Mode	100 %	33 %	50 %	
6 4 4				
Number of observations in mode				
-0,257 -0,326 0,027				
Correlation to index return				

Appendix 2

Key Terms

- B/P = Book value to Price –ratio
- Bid-Ask Bounce = When selling and buying prices of a stock are very far from each other, change on a stock price could be considerable if trade is made. (e.g. current price 10, bid 7, ask 12. If bought return +20%, if sold return -30%)
- CF/P = Cash flow to Price
- D/P = Dividend to Price –ratio
- Earnings Yield = $EBIT / \text{Enterprise value}$
- EBIT = Earnings before interest and taxes
- EBITDA = Earnings Before Interest, Taxes, Depreciation and Amortization
- Enterprise value = Market capitalization + Net debt
- Look-ahead bias = When you are using data that is not available at the portfolio formation, results will suffer from look-ahead bias. (e.g. stocks are ranked based on quarterly data at the end of March and purchase is made on a same day March 31st, in reality data is not available until May/June as it takes time for companies to publish it.)
- MV = Market Value of company
- Net Fixed Assets = Total Assets - Total Current Assets - Goodwill Net
- Net Working Capital = Total Current Assets - (Total Current Liabilities - Short Term Interest Bearing Debt)
- P/E = Price to Earnings –ratio
- Return on Capital = $EBIT / (\text{Net Working Capital} + \text{Net Fixed Assets})$
- Stock price = close price of the day used. In case it happens to be weekend or market is otherwise closed, previous price will be chosen.
- Value premium refers to the greater risk-adjusted return of value stocks over growth stocks.